

REMARKS

Claims 1, 12, and 18 have been amended to correct minor typographical or grammatical errors, or for clarity, and not for reasons related to patentability. Claims 1-20 are pending in the present application. Favorable reconsideration of the pending claims is respectfully requested.

The specification has been amended to correct a minor typographical error and to include the patent number of the issued parent application.

1. Rejections Under 35 U.S.C. § 102

Claims 1-4 and 6-11 have been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,011,304 to Mertol (hereinafter "*Mertol*") for the reasons set forth on pages 2-3 of the Office Action. Applicant respectfully traverses.

The Examiner asserts that Mertol discloses all of the features recited in present claim 1, including "injecting a grease in contact with the active surface of the IC chip such that the grease is . . . in contact with the active surface and the electrical connector." Applicant respectfully disagrees.

Mertol discloses a semiconductor device package that is assembled by attaching a die 1 to a substrate 2, and "first level interconnects 4 are secured to electrically connect the pads on the die 1 to the upper traces 3 on the substrate 2. As shown in FIGS. 5B and 6B, a stiffener 11 is then attached to the substrate 2 and liquid encapsulant 6 is poured over the die 1 and first level interconnects 4 within the stiffener 11. The encapsulant 6 is allowed to solidify by a curing

further teaches that the "controlled encapsulant process provides a flat surface interface for

complete interaction with the heat sink. The thermal connection is further improved by a layer of thermally conductive material" such as silicone grease. (Col. 6, lines 51-54). In the embodiment of Figure 12 of *Mertol*, the thermal grease "is applied between the heat sink 8 and the substrate 2 to improve the thermal conduction of the pathway." (Col. 8, lines 61-64).

Thus, contrary to the invention recited in present claim 1, the grease used in the device of *Mertol* would not be in contact with the active surface of the die or the interconnects, since the encapsulant would block any such contact in the embodiments shown in Figures 7B and 8. In addition, the grease applied between the heat sink and the substrate in the embodiment of Figure 12 of *Mertol* would also not be in contact with the active surface of the die or the interconnects. Hence, not all of the features recited in present claim 1 are taught or suggested by *Mertol*.

Accordingly, for at least the foregoing reasons, claim 1 as well as dependent claims 2-4 and 6-11 are not anticipated by *Mertol*. Applicant therefore respectfully requests that the rejection of these claims under 35 U.S.C. § 102(e) be withdrawn.

Claims 12-14 have been rejected under 35 U.S.C. §102(e) as being anticipated by *Mertol* for the reasons set forth on page 4 of the Office Action. Applicant respectfully traverses.

Present independent claim 12 recites "injecting a grease between the container and the substrate so as to contact the active surface of the flip chip, wherein . . . the grease is in contact with the active surface and the electrical connector." As discussed above with respect to claim 1, the grease used in the device of *Mertol* would not be in contact with the active surface of the die or the interconnects. Thus, not all of the features recited in present claim 12 are taught or

Accordingly, for at least these reasons, claim 12 as well as dependent claims 13-14 are not anticipated by *Mertol*. Applicant therefore respectfully requests that the rejection of these claims under 35 U.S.C. § 102(e) be withdrawn.

2. Rejections Under 35 U.S.C. § 103

Claim 5 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mertol* in view of the article by Hunadi (hereinafter "*Hunadi*") for the reasons set forth on pages 3-4 of the Office Action. Applicant respectfully traverses.

Claim 5 depends from claim 1 and thus includes the limitations thereof. As discussed above, there is no teaching or suggestion in *Mertol* of a grease in contact with the active surface of the IC chip and the electrical connector as recited in claim 1. In addition, there is no specific teaching in *Hunadi* that the grease is placed in contact with the active surface of the IC chip. Rather, *Hunadi* discloses that use of high thermal conductivity greases allows "the user to form a thin cross section of an interface material which is both low stress and removable. ... Additionally, greases can conform to surface irregularities and compensate for nonplanarity on the back side of the flip chip die, the top side of the CSP package or the back side of heat or fan sinks." (Page 28, col. 2). Thus, *Hunadi* teaches that the grease is placed on the back side of a flip chip die, or the top side of a chip scale package, not on the active surface of the IC chip.

Hence, even if the teachings of *Mertol* and *Hunadi* are combined, not all of the limitations of claim 5 would be met, since *Hunadi* teaches that the grease is placed on an inactive

Accordingly, for the foregoing reasons, claim 5 would not have been obvious over *Mertol* in view of *Hunadi*. Thus, Applicant respectfully requests that the rejection of claim 5 under 35 U.S.C. § 103(a) be withdrawn.

Claim 15 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mertol* in view of *Hunadi* for the reasons set forth on page 5 of the Office Action. Applicant respectfully traverses.

Claim 15 depends from claim 12 and thus includes the limitations thereof. As discussed previously, there is no teaching or suggestion in *Mertol* of a grease in contact with the active surface of the flip chip and the electrical connector as recited in claim 12. In addition, there is no teaching in *Hunadi* that the grease is placed in contact with the active surface of the IC chip. Hence, even if the teachings of *Mertol* and *Hunadi* are combined, not all of the limitations of claim 15 would be met.

Accordingly, claim 15 would not have been obvious over *Mertol* in view of *Hunadi*, and Applicant respectfully requests that the rejection of claim 15 under 35 U.S.C. § 103(a) be withdrawn.

Claims 16-20 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mertol* in view of U.S. Patent No. 6,218,202 to Yew et al. (hereinafter "*Yew*") and *Hunadi* for the reasons set forth on pages 5-7 of the Office Action. Applicant respectfully traverses.

Independent claim 16 recites that the grease "is in contact with the electrical connector and with the active surfaces of each of the first and second IC chips." As discussed previously,

contact with the active surface of the IC chip

Yew was cited in the Office Action for the teaching of a chip mounted on the first side of a board-on-chip (BOC) substrate and a second chip having an active surface disposed over the first side of the BOC substrate. Nevertheless, there is no teaching or suggestion in *Yew* of the use of any grease for contact with the active surface of a chip or an electrical connector. Thus, even if the teachings of *Mertol*, *Yew*, and *Hunadi* are combined, not all of the limitations of claim 16 would be met.

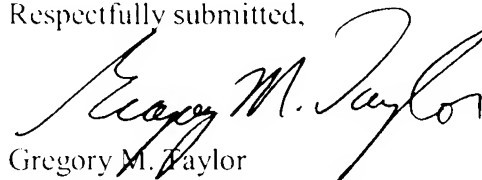
Accordingly, claim 16 and dependent claims 17-20 would not have been obvious over *Mertol* in view of *Yew* and *Hunadi*. Applicant therefore respectfully requests that the rejection of claims 16-20 under 35 U.S.C. § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing, Applicant respectfully requests favorable reconsideration and allowance of the present claims. In the event there remains any impediment to allowance of the claims, which could be clarified in a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney.

Dated this 21st day of March 2003.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW THE CHANGES MADE

IN THE SPECIFICATION:

The paragraph beginning at page 2, line 2 has been amended as follows:

This application is a divisional of U.S. Patent Application Serial No. 09/387,640, filed on August 31, 1999, now U.S. Patent No. 6,424,033 B1, [entitled "Chip Package With Grease Heat Sink and Method of Making".] which is incorporated herein by reference.

The paragraph beginning at page 9, line 15 has been amended as follows:

Figure 1 is an elevational cross-section view of an IC chip package 10 with a board-on-chip (BOC) configuration. Figure 1 illustrates an IC chip 12 disposed upon a substrate 14 such as a flexible PCB. The active surface 16 of IC chip 12 is disposed against a first side 50 of substrate 14. Emerging from the active surface 16 of IC chip 12, are bond wires 18 that act as electrical connectors between active surface 16 of IC chip 12 and substrate 14.

IN THE CLAIMS:

Claims 1, 12, and 18 have been amended as follows:

1. (Once Amended) A method of making an IC chip package having an IC chip with an active surface, the active surface having extending therefrom an electrical connector in electrical communication with the IC chip, the IC chip being mounted upon a substrate, the method comprising:

providing a container disposed upon the substrate; and

enclosing by the container and the substrate, and

is in contact with the active surface and the electrical connector.

12. (Once Amended) A method of making an IC chip package having a flip chip with an inactive surface and an active surface, the active surface having extending therefrom an electrical connector in electrical communication with the flip chip, the flip chip being mounted upon a substrate, the method comprising:

providing a container disposed upon the substrate and in contact with the inactive surface of the flip chip; and

injecting a grease between the [contact] container and the substrate so as to contact [with] the active surface of the flip chip, wherein:

the container with the substrate encloses the grease, the electrical connector, and the flip chip; and

the grease is in contact with the active surface and the electrical connector.

18. (Once Amended) The method as defined in Claim [16] 17, further comprising:

operating the first, second, and third IC chips to generate heat therefrom; and

conducting the heat from the electrical connector and from the first, second, and third IC chips to the grease, to the container, and to the ambient.